

## ABSTRACT

The present invention concerns methods and devices for creating and printing variable size and variable resolution holographic stereograms and holographic optical elements using computer rendered images of three-dimensional computer models or using computer processed images. The present invention is an apparatus and method for printing one-step, full-color, full-parallax holographic stereograms utilizing a reference beam-steering system that allows a reference beam to expose a holographic recording material from different angles. More particularly, a coherent beam is split into object and reference beams. The object beam passes through an object beam unit in which a rendered image is displayed, while the reference beam passes through the reference beam-steering system. The object and reference beams interfere with each other at an elemental hologram on a holographic recording material. A computer controls the exposure time and the movement of the recording material and may also render the images displayed in the object beam unit. In addition, the computer may also store the images before they are displayed in the object beam unit. Also, the present invention may also utilize a voxel-control lens placed in the path of the object beam and in close proximity to the holographic recording material to control the resolution of a holographic stereogram. In addition, the present invention may also utilize interchangeable band-limited diffusers and reference-beam masking plates. Furthermore, the present invention incorporates viewing zone techniques to the rendering process for one-step, holographic stereograms to produce animated, one-step, holographic stereograms.

10014621-121101